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Discovery of a New Planet. By M. Luther.

Mr. Hind has received a letter from M. Luther, announcing his discovery of a new planet of the eleventh magnitude on the 19th of April, at the Observatory of Bilk. The following are two of its positions as provisionally reduced:—

1855.	Bilk M.T. h m	R.A. ° ′	Decl. ° ′
April 19	13 30	181 14	−5 11
20	10 27	181 6	−5 11
	Daily motion	−9	0

Discovery of a New Comet (Comet II., 1855).
By M. Schweizer.

On the 11th of April, about 11 o'clock in the evening, Dr. Schweizer, Astronomer, attached to the Geodesical Observatory of Constantine at Moscow, discovered a small telescopic comet, for which he obtained the following approximate positions by reference to Argelander's Star Charts:—

1855.	M.T.	Comet's R.A. ° ′	Comet's Decl. ° ′
April 11	11	184 40	−17 20
15	11	182 20	−13 40

Its daily motion is accordingly at present about,—

	′
In R.A.	−35 0
In Decl.	+55 0

On the Method of Observing the Positions of Spots on the Sun, and of Deducing their Heliographical Longitude and Latitude, adopted at Redhill Observatory. By R. C. Carrington, Esq.

"No change has been made in the mode of observation described in No. 5 of vol. xiv. of the *Monthly Notices*, but an improvement of the process of reduction has been introduced, which it is the object of this second communication to explain.

"Referring generally to the former description, and as before denoting by the letters A_1, A_2, B_1, B_2, the instants of contact of the sun's limb with the wires $A\,a$, $B\,b$, and by the letters a, b, those of a spot,

let $$A = \tfrac{1}{2}(A_1 + A_2), \quad B = \tfrac{1}{2}(B_1 + B_2)$$

also let $$\tan \alpha_1 = \frac{B_2 - B_1}{A_2 - A_1}, \text{ and } \tan \alpha_2 = \frac{b - B}{a - A} \cdot \operatorname{cotan} \alpha_1,$$

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then will $\alpha_1 + \alpha_2 + \iota$ be the angle of position of the spot on the disk from the north point reckoned towards the east, ι being the correction due to the inclination of the sun's path to a parallel of declination, and very nearly equal to four times the hourly increment of declination given in the *Nautical Almanac*, with its proper sign. If we denote the distance of the spot from the centre of the disk, expressed as a decimal of the radius, by $\frac{r}{R}$, we shall have

$$\frac{r}{R} = 2 \,.\, \frac{b - B}{B_2 - B_1} \,.\, \operatorname{cosec} \alpha_2, \text{ or } = 2 \,.\, \frac{a - A}{A_2 - A_1} \,.\, \sec \alpha_2$$

the first or the second expression of the two being used, accordingly as $b - B$ is greater or less than $a - A$.

"Let (R) be the sun's tabular semidiameter expressed in minutes of arc, and let $\varrho' = \frac{r}{R} \,.\, (R)$, then will ϱ, the angular distance of the spot on the sun's body from its apparent centre, be found from the expression $\varrho = \sin^{-1} \,.\, \frac{r}{R} - \varrho'$, the angle $\varrho + \varrho'$ being taken out to minutes and tenths.

"The quantities $\alpha_1 + \alpha_2 + \iota$ and $\frac{r}{R}$ give the means of forming a diagram of the appearance of the disk.

"*Second Step.*—Let the inclination of the sun's equator to the ecliptic be denoted by I, and the longitude of its ascending node by N. (The provisional values used at Redhill for 1854·0 are $I = 7^\circ\ 10'$, and $N = 74^\circ\ 30'$.) It is convenient to tabulate, for every degree of argument, the angles

$$\beta = \tan^{-1} (\cos \odot \,.\, \tan \omega), \qquad \gamma = \tan^{-1} (\cos \overline{\odot - N} \,.\, \tan I),$$

$$\alpha = \tan^{-1} (\tan \overline{\odot - N} \,.\, \cos I), \qquad \delta = \cos^{-1} (\sin \overline{\odot - N} \,.\, \sin I),$$

where α and δ are respectively the heliographical longitude and north polar distance of the earth.

Let

$$\begin{aligned} \chi &= \overline{\alpha_1 + \alpha_2 + \iota} + \overline{\beta + \gamma} \\ \cos \phi &= \cos \varrho \,.\, \cos \delta + \cos \chi \,.\, \sin \varrho \,.\, \sin \delta, \\ \sin \theta &= \sin \chi \,.\, \sin \varrho \,.\, \operatorname{cosec} \phi \end{aligned}$$

then will $\overline{\alpha - \theta}$ and ϕ be the heliographical longitude and north polar distance of the spot.

"It will be remarked that no account is here taken of the effect of refraction. The reason is, that a little experience convinced me that, unless its effect could be allowed for in current reductions in some very simple manner, it was better to omit it; and I have not been able to devise any mode of computing a correction for it at all corresponding in brevity to the above formulæ.

"The brevity of the formulæ now given will best be shown by an example, and for this purpose we will take an observation of the principal nucleus of the large spot seen in January last.

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“ The mean of three passages on Jan. 18th gave the following numbers :—

	h m s				
A_1	19 36 28·867	Slow $55^{s}·5$		Longitude $41^{s}·3$ W.	
B_1	36 43·867	G. M. T. of obs.		1855, Jan. 17^{d} 23^{h} 51^{m}.	
			° ′		° ′
a	37 40·133	☉	= 297 53·7	β	= + 11 28·8
b	38 5·067	N	= 74 30·7	γ	= − 5 13·2
A_2	39 48·067	☉ − N	= 223 23·0	ι	= + 2·1
B_2	19 39 59·800	α	= 43 9·5	δ	= 94 55·0

$B_2 - B_1$	= 195·933	Log	= 2·29211	Log tan α_1	= 9·99282
$A_2 - A_1$	= 199·200	Log	= 2·29929	α_1	= 44° 31′·6

$b - B$	= − 16·767	Log $(b - B)$	= − 1·22445
$a - A$	= − 28·334	Log $(a - A)$	= − 1·45231
Log $(a - A)$	= 1·45231	Diff.	= + 9·77214
Log $(A_2 - A_1)$	= 2·29929	Log tan α_1	= 9·99282
Diff.	= 9·15302	Log tan a_2	= + 9·77932
Log sec α_2	= 0·06708	α_2	= 211° 1′·9
Log 2	= 0·30103	α_1	= 44 31·6
Log $\frac{r}{R}$	= 9·52113	ι	= + 2·1
Log (R)	= 1·212	$\beta + \gamma$	= + 6 15·6
Log ϱ'	= 0·733	χ	= 261 51·2
Log cos ϱ	= 9·97488	$\varrho + \varrho'$	= 19 23·4
Log cos δ	= − 8·93301	ϱ'	= 5·4
Log n_1	= − 8·90789	ϱ	= 19 18·0
Log cos χ	= − 9·15140	Log sin χ	= − 9·99559
Log sin ϱ	= 9·51919	Log sin ϱ	= 9·51919
Log sin δ	= 9·99840	Log cosec ϕ	= 0·00357
Log n_2	= − 8·66899	Log sin θ	= − 9·51835
n_1	= − 0·08089	θ	= − 19° 15′·6
n_2	= − 0·04667	α	= 43 9·5
$n_1 + n_2$	= − 0·12756	$\alpha - \theta$	= 62 25
Log $(n_1 + n_2)$	= − 9·10571	ϕ	= 97 20

“ The result of the calculation is accordingly,—

Angle of position, 255° 35′·6 Dist. from centre, 0·3320
Heliographical long. 62° 25′ Latitude, 7° 20′ South

“ As was mentioned in the Annual Report lately published, this process of reduction has been applied at Redhill to all the observations of spots which were obtained during the past year, and a tolerably continuous catalogue of positions and of corresponding diagrams is consequently accumulating. As I feel well satisfied after a full trial with the method now put forth, and think it improbable that a shorter one can be devised, I

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venture again to express a hope that those who interest themselves in this subject will give my method a trial.

" The following series of observations of a small spot may be useful as exhibiting the degree of accuracy of the results obtained:—

1854.	G.M.T. h m	Pos. ° ′	Dist.	H. Long. ° ′	H. Lat. ° ′
Aug. 25	0 12	123 2	·9399	189 24	S. 10 14
26	0 51	126 44	·8445	203 23	10 20
27	1 32	132 9	·7022	218 10	10 3
28	0 41	141 24	·5481	231 56	10 13
29	0 38	159 58	·3912	246 19	10 23
30	0 32	195 9	·3031	260 29	10 23
31	1 6	235 23	·3611	275 6	10 19
Sept. 1	0 24	256 34	·5033	288 54	10 8
4	The spot had entirely disappeared.				

" Such series, it is needless to state, are suitable for a basis for the further correction of the assumed elements of the position of the sun's poles. I have, of course, several such series already observed, but they are not yet sufficiently numerous to warrant the adoption of any certain corrections of the assumed values of I and N. The problem of correcting the assumed position of the sun's axis from such data is similar to the case of finding the error of position of the polar axis of an equatoreal from three or more observations in north polar distance of the same star at different hour-angles.

" My observations during 1854 suggest one or two remarks which may be appended here, although they are, I hope, by no means all that they will ultimately afford.

" 1. The year 1854 has been one in which the number of outbreaks has been very few,—indeed, approaching a minimum. Now the reduced list of positions includes no spot more distant from the equator than 19° 30′ to the north, and 17° 0′ to the south. This circumstance appears to afford grounds for concluding that when the eruptive forces are comparatively quiet, the limits of parallel are also much contracted.

" 2. On the 29th of September I observed a moderate-sized spot in position 110° 17′ from the north point, distance from centre = 0·9323, the penumbra of which included two detached nuclei; on the following day, the 30th, it was observed that the 'following' nucleus was outside the penumbra. Careful diagrams were made at the time on both days. I cannot reconcile this observation with the commonly received idea of the relation of nucleus and penumbra. As an isolated instance, it does not appear to call for more than being recorded at present; or rather I may say that, until other instances shall be met with, it appears to me to be premature to state the inferences which the observation seems to suggest.

" 3. Throughout the year 1854 there has been a continual

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tendency to recurrence of spots on the same parallels of latitude, both of individual spots on almost precisely the same parallel, and of groups within the same general limits. The parallels 71° to 75° Heliog. N.P.D. have been but rarely visited; the parallels 77° to 85°, frequently; from 86° 30′ to 89° 30′, not at all; from 90° to 92°, very rarely; from 92° to 94°, not at all; from 95° to 103°, frequently; from 103° to 107°, very rarely. In connexion with this circumstance, I would suggest whether it be not worth while to examine into the possibility of an explanation arising from the hypothetical revolution of an inner body, on which may be situated the volcanic centres of eruption, in a shorter period than the revolution of the envelope on which we see the effects in the form of ruptures of continuity. It will appear to any one who considers this suggestion that, to bring it to the test of facts, there will be required a collection of observed positions of nuclei on the same parallel, together with the times of their first appearance on the envelope; and accordingly, I would recommend fellow-labourers on this subject to be careful to record the occurrence of outbreaks which they may succeed in ascertaining to have taken place between two consecutive days."

Remarks on the Orbits of α Centauri and σ Coronæ Borealis.

By Capt. W. S. Jacob, Astronomer at Madras.

In the *Monthly Notices* for January are given the elements of two orbits for *α Centauri*, contributed by Messrs. E. B. Powell and J. R. Hind. The latter, probably, represents the observations pretty fairly, but the former can scarcely be said to do so, as it makes the observed distances before 1846 all too great, and after that epoch all too small, while even in the angles there is in a general way the same opposition of signs, though not quite without exception; in such a case, it is evident that the sum of the errors or of their squares must be capable of considerable reduction.

"But, in fact, the agreement of the orbit with observation is no proof that it is even an approximation to the true one: where we have given only a small portion of the periphery of an ellipse, it is evident that with a very slight change of curvature we may adapt it to many different ellipses; and, even when we are pretty sure of the dimensions of the apparent ellipse, it may happen that a very slight change of position of the projected focus may cause a great variation in the true elements. This is the case in the present instance: I have computed a number of orbits for this star, but for some years have given up the attempt, as the data are insufficient; though we can lay down the apparent orbit very closely, we cannot as yet get even a decent approximation to the true one.

"The reason is this: La Caille's observations in 1751, though not, of course, minutely accurate, enable us to fix the periodic time within a small quantity; since the stars had returned to the same